

## CLAIMS

What is Claimed is:

1. A method of determining a gate oxide thickness of an operational  
5 MOSFET (metal oxide semiconductor field effect transistor) fabricated with a  
gate oxide formation process, comprising:

a) providing said operational MOSFET fabricated with said gate  
oxide formation process;

b) coupling a drain node and a source node of said operational  
10 MOSFET to a ground;

c) applying a range of voltages at a gate node of said operational  
MOSFET and measuring at said gate node a gate direct tunneling current for  
each applied voltage to generate a plurality of measured data;

d) providing a gate direct tunneling current model; and

15 e) determining said gate oxide thickness by fitting said gate direct  
tunneling current model to said measured data and using a gate oxide  
thickness variable as a fitting parameter.

2. A method as recited in Claim 1 wherein said gate oxide thickness  
20 is no less than approximately 3 nanometers.

3. A method as recited in Claim 1 wherein said gate oxide thickness  
is no greater than approximately 3 nanometers.

25 4. A method as recited in Claim 1 wherein a channel length of said  
operational MOSFET is no less than approximately 0.5 micrometers.

5. A method as recited in Claim 1 wherein a channel length of said  
operational MOSFET is no greater than approximately 0.5 micrometers.

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6. A method as recited in Claim 1 wherein a channel width of said operational MOSFET is no less than approximately 5 micrometers.

7. A method as recited in Claim 1 wherein a channel width of said operational MOSFET is no greater than approximately 5 micrometers.

8. A method as recited in Claim 1 wherein in said step c) said operational MOSFET is operated in an inversion mode by application of a particular range of voltages at said gate node.

9. A method as recited in Claim 1 wherein said gate direct tunneling current model includes a value representing reflectivity of an electron from an inversion layer due to a gate oxide energy barrier.

10. A method of determining a gate oxide thickness of an operational NMOSFET (n-type metal oxide semiconductor field effect transistor), comprising:

- a) coupling a drain node and a source node of said operational NMOSFET to a ground;
- b) applying a range of voltages at a gate node of said operational NMOSFET and measuring at said gate node a gate direct tunneling current for each applied voltage to generate a plurality of measured data;
- c) providing a gate direct tunneling current model; and
- d) determining said gate oxide thickness by fitting said gate direct tunneling current model to said measured data and using a gate oxide thickness variable as a fitting parameter.

11. A method as recited in Claim 10 wherein said gate oxide thickness is no less than approximately 3 nanometers.

12. A method as recited in Claim 10 wherein said gate oxide thickness is no greater than approximately 3 nanometers.

13. A method as recited in Claim 10 wherein a channel length of said operational NMOSFET is no less than approximately 0.5 micrometers.

14. A method as recited in Claim 10 wherein a channel length of said operational NMOSFET is no greater than approximately 0.5 micrometers.

15. A method as recited in Claim 10 wherein a channel width of said operational NMOSFET is no less than approximately 5 micrometers.

16. A method as recited in Claim 10 wherein a channel width of said operational NMOSFET is no greater than approximately 5 micrometers.

17. A method as recited in Claim 10 wherein in said step b) said operational NMOSFET is operated in an inversion mode by application of a particular range of voltages at said gate node.

18. A method as recited in Claim 10 wherein said gate direct tunneling current model includes a value representing reflectivity of an electron from an inversion layer due to a gate oxide energy barrier.

19. A system for determining a gate oxide thickness, comprising:  
an operational MOSFET (metal oxide semiconductor field effect transistor) fabricated with a gate oxide formation process, said operational MOSFET including a drain node coupled to a ground, a source node coupled to said ground, and a gate node, wherein a range of voltages are applied at said gate node and a gate direct tunneling current is measured at said gate node for each applied voltage to generate a plurality of measured data; and

a data processor for determining said gate oxide thickness by fitting a gate direct tunneling current model to said measured data and using a gate oxide thickness variable as a fitting parameter.

5           20.    A system as recited in Claim 19 wherein said gate oxide thickness is no less than approximately 3 nanometers.

10           21.    A system as recited in Claim 19 wherein said gate oxide thickness is no greater than approximately 3 nanometers.

            22.    A system as recited in Claim 19 wherein a channel length of said operational MOSFET is no less than approximately 0.5 micrometers.

15           23.    A system as recited in Claim 19 wherein a channel length of said operational MOSFET is no greater than approximately 0.5 micrometers.

            24.    A system as recited in Claim 19 wherein a channel width of said operational MOSFET is no less than approximately 5 micrometers.

20           25.    A system as recited in Claim 19 wherein a channel width of said operational MOSFET is no greater than approximately 5 micrometers.

25           26.    A system as recited in Claim 19 wherein said operational MOSFET is operated in an inversion mode by application of a particular range of voltages at said gate node.

30           27.    A system as recited in Claim 19 wherein said gate direct tunneling current model includes a value representing reflectivity of an electron from an inversion layer due to a gate oxide energy barrier.